

High-Definition Multimedia Interface

Version 2.0

Quantum Data MOI v1.0

Test ID: HF1-24

April 22, 2015

Preface

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Contact Information

The URL for the HDMI Forum web site is: <http://www.hdmiforum.org/>

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Table of Contents

Preface.....	2
<i>Notice.....</i>	<i>2</i>
Document Revision History.....	2
<i>Intellectual Property</i>	<i>2</i>
<i>Contact Information</i>	<i>2</i>
Introduction	4
Scope	4
References	4
<i>Normative References</i>	<i>4</i>
<i>Informative Reference</i>	<i>4</i>
Test ID HF1-24: Source Video Timing – 6G – Non-2160p 24-bit Color Depth	5
<i>Objective</i>	<i>5</i>
<i>Reference</i>	<i>5</i>
<i>Requirement</i>	<i>5</i>
<i>Capability(s)</i>	<i>5</i>
<i>Test Equipment</i>	<i>5</i>
<i>Generic Procedure.....</i>	<i>5</i>
<i>Vendor Specific Test Procedure</i>	<i>8</i>

Introduction

This document provides a set of Method of Implementation for test method described in HDMI Compliance Test Specification Version 2.0 (HDMI CTS 2.0). HDMI Forum created HDMI CTS 2.0 to specify a set of tests that should be performed to verify features described in HDMI Specification Version 2.0.

Scope

This document provides testing procedures for HDMI CTS 2.0 Test ID HF1-24: Source Video Timing – 6G – Non-2160p 24-bit Color Depth.” The procedure below deals with single resolution and only one Test ID is considered at a time.

References

Normative References

High-Definition Multimedia Interface Specification Version 1.4b, October 11, 2011.
HDMI Compliance Test Specification Version 1.4b, October 11, 2011.
High-Definition Multimedia Interface Specification Version 2.0, August, 2013.
HDMI Compliance Test Specification Version 2.0.

Informative Reference

No additional informative references.

Test ID HF1-24: Source Video Timing – 6G – Non-2160p 24-bit Color Depth

Objective

Confirm that the Source, whenever transmitting any 24bits color depth non-2160p Video Timing with a TMDS Character Rate that is greater than 340Mcsc, complies with all of the required Pixel and line counts.

Table 7-50 Source Video Timing – 6G –Non-2160p 24-bit Color Depth Requirements

Reference	Requirement
[HDMI 2.0: 10.1] Use of the AVI InfoFrame in This Specification	<See reference for details>

Capability(s)

The Source DUT supports the transmission of any 24-bit Color Depth non-2160p Video Timing with a TMDS Character Rate that is greater than 340Mcsc.

Test Equipment

Item	Generic Equipment	Vendor Specific Equipment	Quantity
1	HDMI 2.0 Protocol Analyzer	980 Advanced Test Platform series: 980 HDMI 2.0 Protocol Analyzer module HDMI CTS 2.0 Compliance Test Package #3	1

Generic Procedure

- 1 If the CDF field Source_non_2160p_Video_Formats_Above_340 is empty, then SKIP this test.
Setup:
- 2 Connect the Source DUT to the Protocol Analyzer.
- 3 Configure the EDID, which indicates all of the Video Timings necessary for this test.
Measure:
- 4 For each Video Timing listed in the CDF fieldSource_non_2160p_Video_Formats_Above_340, perform the following:
 - 4.1 Operate the Source DUT to output the tested format at a color depth of 24 bits per Pixel. For all of the following, refer to the values listed in CEA-861-F (section 4) for the tested format; for formats not listed in CEA-861-F, refer to CDF field Source_non_2160p_Video_Formats_Above_340_Video_Timings for the applicable definition of the Video Timing.
 - 4.2 Measure the TMDS Clock Rate with a 1753 frequency counter.

- 4.3 If the TMDS Clock Rate is outside the allowable range, then FAIL.
- 4.3.1 The nominal TMDS Clock Rate is $\frac{1}{4}$ of the nominal TMDS Character Rate of the Video Timing being tested.
- 4.3.2 For video frame rates of 24, 30 Hz and multiples thereof, the allowed variation is +0.5%/-0.6%; for non-2160p video frame rates, the allowed variation is +0.5%/-0.5%.
- 4.4 Capture and descramble the data (except for one unscrambled Control Period per field) and verify the tested format as follows:
- 4.5 From the beginning of the captured data, scan for the first Video Data Period.
- 4.6 Examine the HSYNC and VSYNC polarity values.
- 4.7 If the polarity of either HSYNC or VSYNC does not equal the correct value for the selected Video Timing, then FAIL.
- 4.8 For each HSYNC active edge, examine all HSYNC and Video Data Periods to calculate following variables:
- HS_LEN = number of Pixels that HSYNC remains active.
 - VIDEO_TO_HS = number of Pixels from the end of the Video Data Period to HSYNC active edge.
 - H_ACTIVE = number of Pixels in the Video Data Period minus 2 (for the GuardBand)
 - H_TOTAL = number of Pixels between two HSYNC active edges.
- 4.9 If any of the values of HS_LEN, VIDEO_TO_HS, H_ACTIVE and H_TOTAL do not equal the correct value for the selected Video Timing, then FAIL.
- (NOTE: HS_LEN and VIDEO_TO_HS correspond to Hsync and Hfront, respectively, in CEA-861-F)
- 4.10 Examine the VSYNC/HSYNC relationship for two video fields.
- If the VSYNC active edge alternates from field-to-field between coincident with HSYNC and mid-point between two HSYNC active edges then SCAN = INTERLACED.
 - If VSYNC is coincident with HSYNC on every field then SCAN = PROGRESSIVE.
- 4.11 For each VSYNC active edge, calculate following variables:
- VS_LEN = number of Pixels that VSYNC remains active divided by H_TOTAL, rounded to the nearest half-integer (e.g. 5.8 and 6.2 get rounded to 6; 6.3 and 6.7 get rounded to 6.5).
 - V_ACTIVE = number of Video Data Periods between two consecutive VSYNC active edges.

- V_TOTAL = number of Pixels between the VSYNC active edges divided by H_TOTAL , rounded to the nearest half-integer.

4.12 If SCAN is equal to PROGRESSIVE, examine all VSYNC, HSYNC and Video Data Periods to calculate the following variables:

- VS_TO_VIDEO = the number of HSYNC pulses between the VSYNC active edge and the first subsequent Video Data Period, not including the HSYNC pulse that is coincident (or nearly so) with the VSYNC active edge.

4.13 If SCAN is equal to INTERLACED, examine all VSYNC, HSYNC and Video Data Periods to calculate following variables:

- VS_TO_VIDEO = the number of HSYNC pulses between the VSYNC active edge and the first subsequent Video Data Period, not including the HSYNC pulse for Field 1 that is coincident (or nearly so) with the VSYNC active edge or the HSYNC pulse for Field 2 that follows the VSYNC edge by $\frac{1}{2}$ line.

4.14 If any of the values of VS_LEN , VS_TO_VIDEO , V_ACTIVE and V_TOTAL do not equal the correct value for the selected Video Timing, then FAIL.

(NOTE: VS_LEN and VS_TO_VIDEO correspond to Vsync and Vsync+Vback, respectively, in CEA-861-F)

Vendor Specific Test Procedure

Test Equipment

A variety of equipment is needed for testing HDMI products. Each piece is authorized and included by name in this Compliance Test Specification. This section describes the Quantum Data test equipment.

HDMI 2.0 Protocol Analyzer module

The Quantum Data 980 HDMI 2.0 Protocol Analyzer module can be installed in the 980B or 980R series Advanced Test Platforms. This 980 HDMI 2.0 Protocol Analyzer module serves the generic test functions called out in the HDMI 2.0 Generic CTS. Refer to the table below:

Item	Quantum Data Equipment	
1	980 Advanced Test Platform series:	
	Equipped with:	980 HDMI 2.0 Protocol Analyzer module
		HDMI CTS 2.0 Compliance Test Package #3

980 HDMI 2.0 Protocol Analyzer Module with 980 Series Platform Configurations

The figures below show depictions of the 980 HDMI 2.0 Protocol Analyzer module equipped in various 980 series platforms. **Note:** Card positioning may vary depending on configuration.



AVI InfoFrame and GCP – 6G – 2160p

Test ID HF1-18: Source AVI InfoFrame and GCP – 6G – 2160p

1. Objective

Confirm that the Source, whenever transmitting any 2160p Video Format for TMDS Character Rate above 340Mcsc up to 600Mcsc, transmits an accurate AVI InfoFrame at least once per every two video fields and appropriate color depth as indicated by GCP.

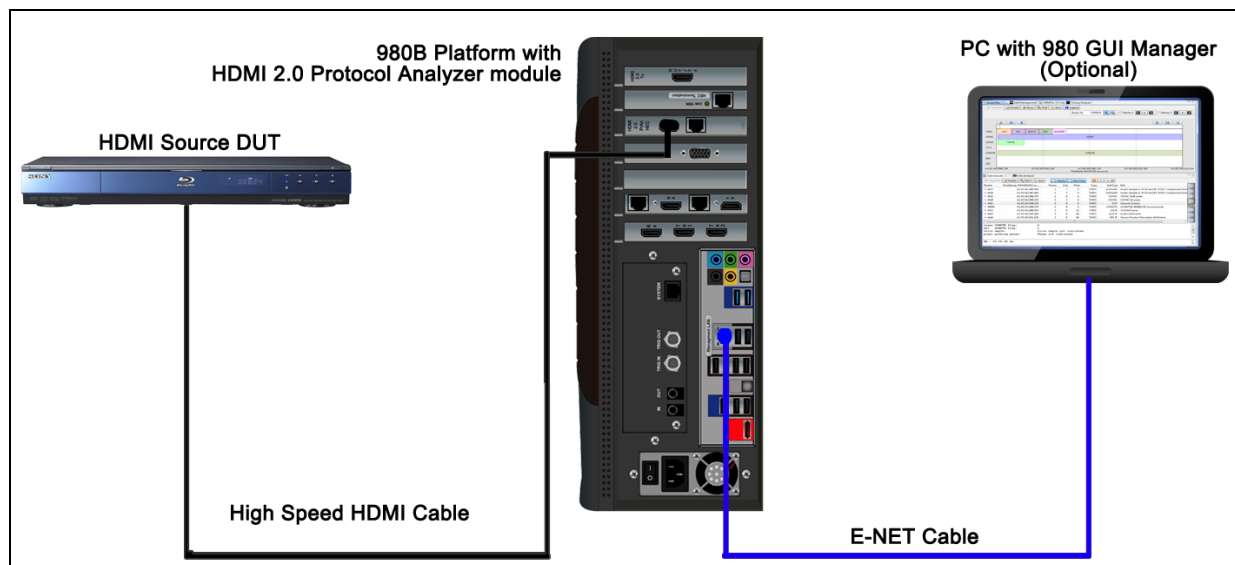
2. Test Overview

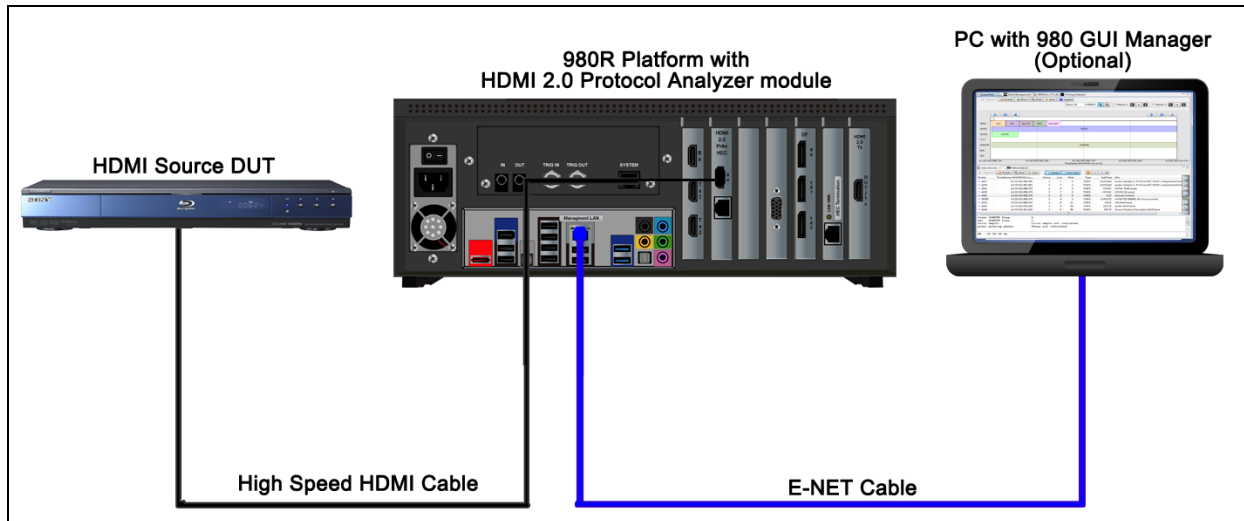
The Pass/Fail criteria is assessed by the application with no human examination required.

3. Procedure

Use the following procedure to conduct this test.

- 1 Connect Source DUT to the Quantum Data 980 HDMI 2.0 Protocol Analyzer at the module's port labeled Rx. Use a High Speed HDMI cable. The figures below show depictions of connections to the 980 HDMI 2.0 Protocol Analyzer module residing in the 980 series chassis.

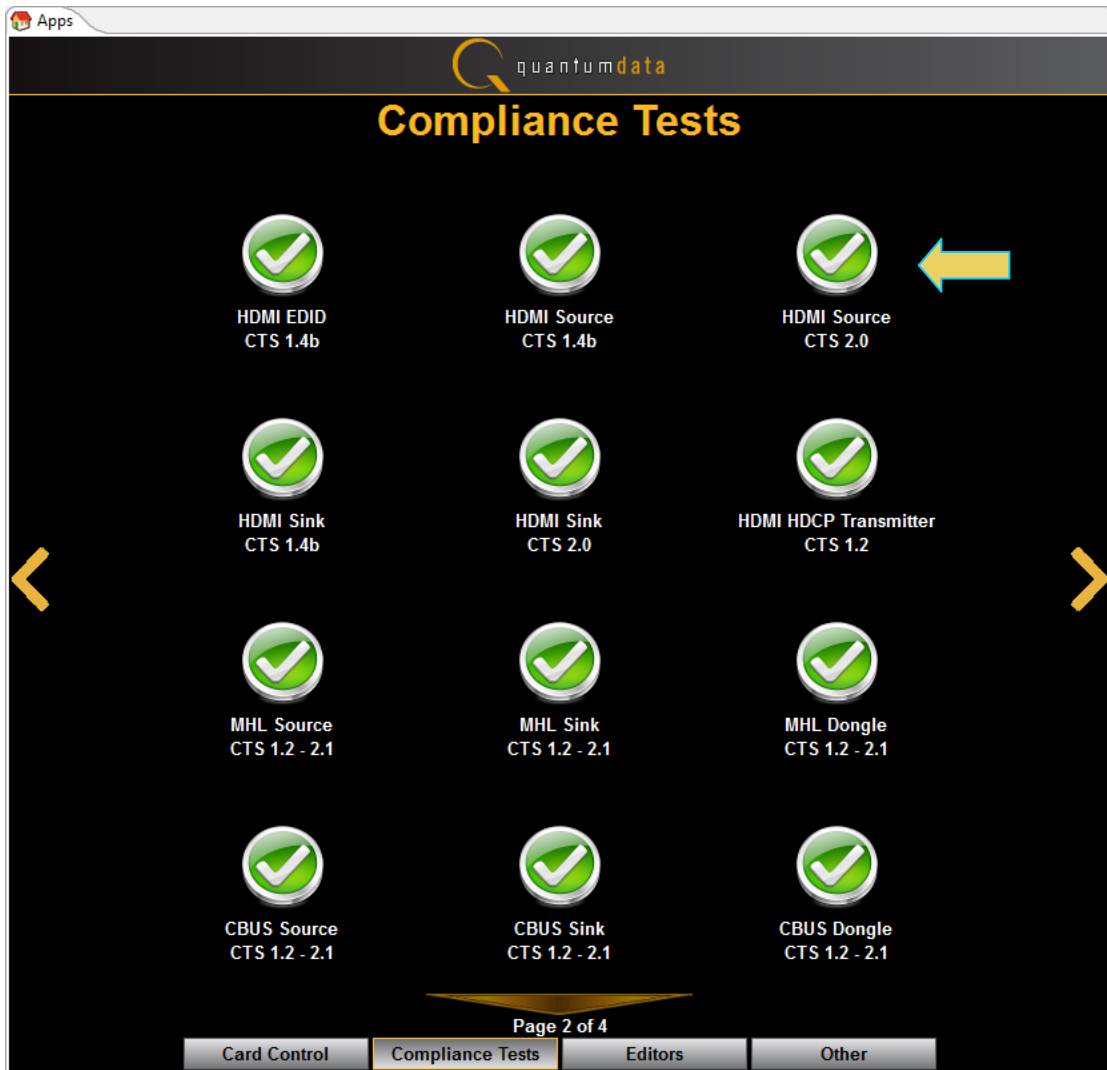




- 2 Operate the Source DUT to output the supported formats.
- 3 Use Quantum Data 980 Embedded Manager GUI (touchscreen) or invoke Quantum Data 980 External Manager GUI (Windows application).

Note: You will not need to connect the PC shown in the figures above if you are running the compliance test through the 980's embedded display. The PC running the 980 HDMI Protocol Analyzer module's compliance test application is connected to the 980 through a standard Ethernet cable.

- 4 Complete the following steps:
 - 4.1 Click on the HDMI Source CTS 2.0 icon in the Compliance Tests page of the Apps panel.



- 4.2 Navigate to the CDF tab if not already there. If there is a saved CDF file, then click on Open and select it. Otherwise, enter the DUT's CDF information for each tab and optionally click on Save to save the CDF.

HDMI 2.0 Src CT 2.0

CDF Entry Test Selection Test Options / Preview

Open New Save CDF File: /CDF/XYZ_Source

General Y420 Video 21:9 (64:27) Video 6G Video 50p Timings

Source_ITURBT_2020_101 Does the DUT support ITU-R BT.2020 Y'CC'BCC'RC Colorimetry?
☐ Yes ☒ No

Source_ITURBT_2020_110 Does the DUT support ITU-R BT.2020 Y'C'BC'R Colorimetry?
☐ Yes ☒ No

Source_LTE_340Mscsc_Scrambling Does the product support scrambling for TMDS Character Rates at or below 340Mscsc?
☐ Yes ☒ No

Source_Above_340 Does the product support any Video Format/color mode for TMDS Character Rate above 340Mscsc up to 600Mscsc?
☒ Yes ☐ No

Source_2160p_Video_Formats_Above_340

(96) 3840x2160p @ 50 Hz 16:9	<input checked="" type="radio"/> Yes <input type="radio"/> No
(97) 3840x2160p @ 60 Hz 16:9	<input checked="" type="radio"/> Yes <input type="radio"/> No
(101) 4096x2160p @ 50 Hz 256:135	<input type="radio"/> Yes <input checked="" type="radio"/> No
(102) 4096x2160p @ 60 Hz 256:135	<input type="radio"/> Yes <input checked="" type="radio"/> No
(106) 3840x2160p @ 50 Hz 64:27	<input checked="" type="radio"/> Yes <input type="radio"/> No
(107) 3840x2160p @ 60 Hz 64:27	<input checked="" type="radio"/> Yes <input type="radio"/> No

Source_2160p_DC_Video_Formats_Above_340

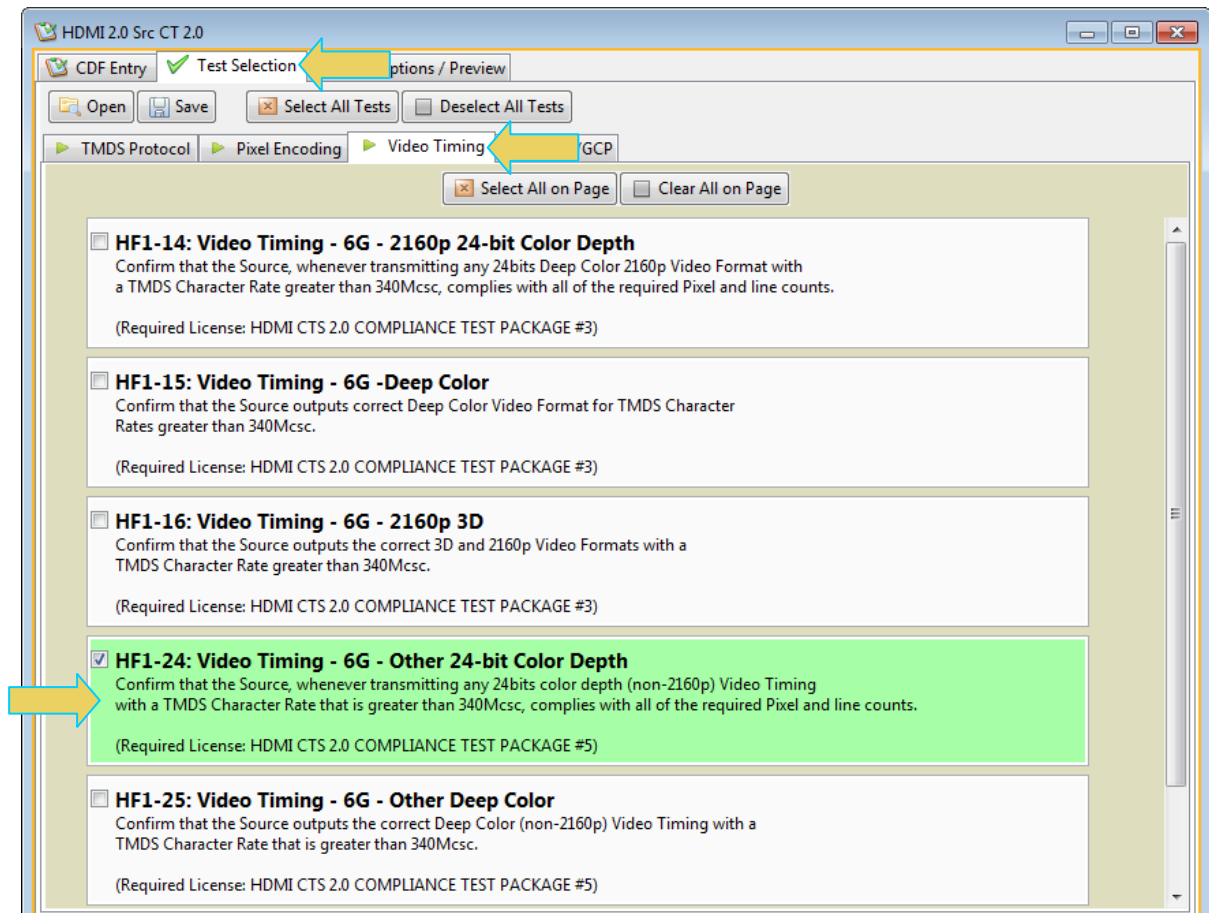
Format	30	36	48	(bits per pixel)
(93) 3840x2160p @ 24 Hz 16:9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(94) 3840x2160p @ 25 Hz 16:9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(95) 3840x2160p @ 30 Hz 16:9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(98) 4096x2160p @ 24 Hz 256:135	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(99) 4096x2160p @ 25 Hz 256:135	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(100) 4096x2160p @ 30 Hz 256:135	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(103) 3840x2160p @ 24 Hz 64:27	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(104) 3840x2160p @ 25 Hz 64:27	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)
(105) 3840x2160p @ 30 Hz 64:27	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(bits per pixel)

Source_2160p_3D_Video_Formats_Above_340

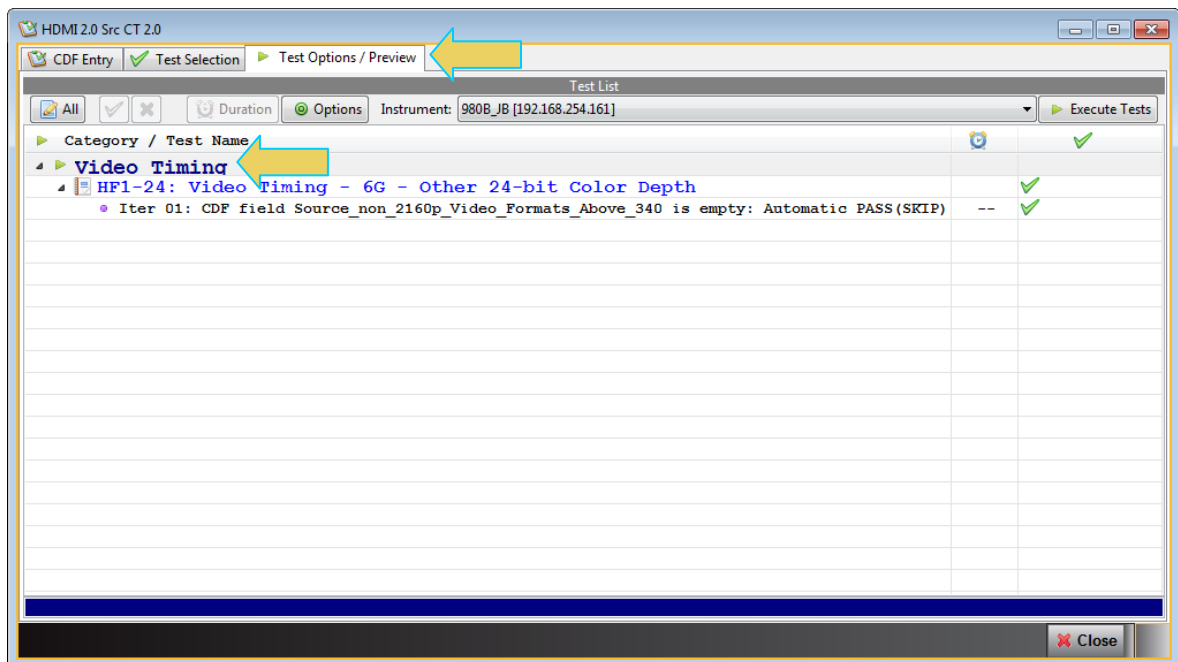
(95) 3840x2160p @ 30 Hz 16:9 - Frame Packing	<input type="radio"/> Yes <input checked="" type="radio"/> No
(94) 3840x2160p @ 25 Hz 16:9 - Frame Packing	<input type="radio"/> Yes <input checked="" type="radio"/> No
(93) 3840x2160p @ 24 Hz 16:9 - Frame Packing	<input type="radio"/> Yes <input checked="" type="radio"/> No
(98) 4096x2160p @ 24 Hz 256:135 - Frame Packing	<input type="radio"/> Yes <input checked="" type="radio"/> No
(100) 4096x2160p @ 30 Hz 256:135 - Frame Packing	<input type="radio"/> Yes <input checked="" type="radio"/> No
(99) 4096x2160p @ 25 Hz 256:135 - Frame Packing	<input type="radio"/> Yes <input checked="" type="radio"/> No
(97) 3840x2160p @ 60 Hz 16:9 - Side-by-Side (Half)	<input checked="" type="radio"/> Yes <input type="radio"/> No
(96) 3840x2160p @ 50 Hz 16:9 - Side-by-Side (Half)	<input checked="" type="radio"/> Yes <input type="radio"/> No

Close

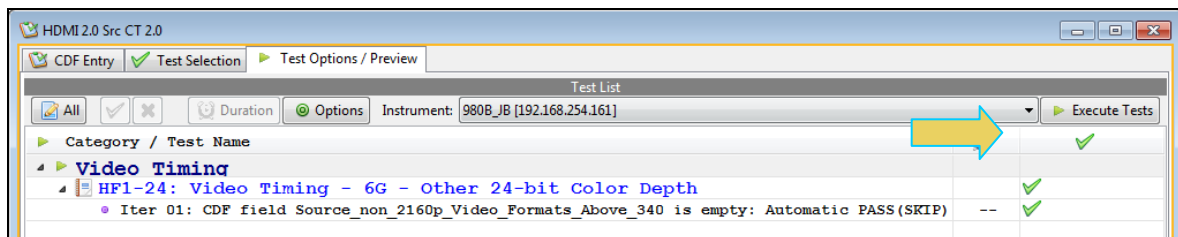
- 4.3 Click on the Test Selection tab and the Video Timing sub tab and select the Test ID HF1-24: Source Video Timing – 6G – Non-2160p 24-bit Color Depth Test. Refer to the sample screen below.



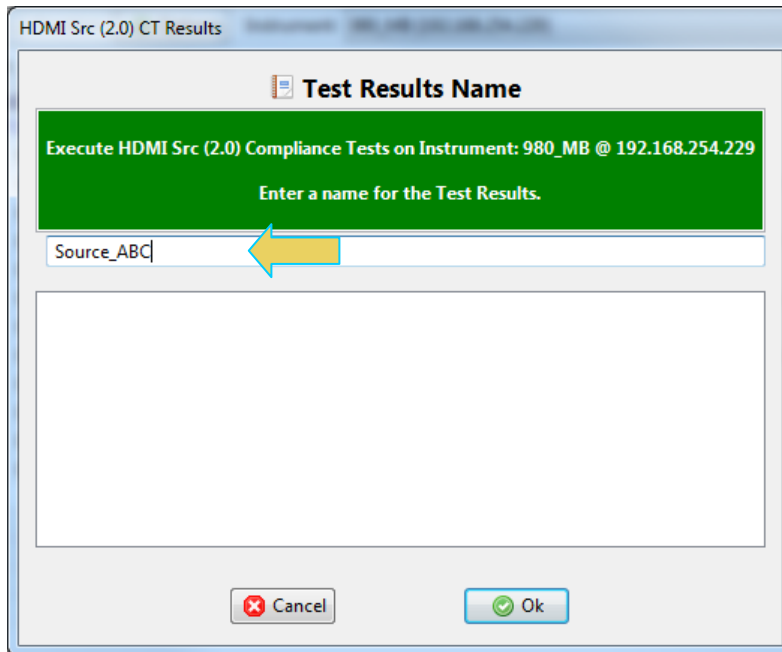
- 4.4 Click on Test Options / Preview tab and review the list of tests. Refer to the sample screen below.



4.5 Click on Execute tests activation button to initiate the test. Refer to the sample screen below.



Note: You will be prompted with a dialog box to assign a name to the test results. Refer to the screen example below:



Enter a name, click OK and the test will begin.

A Test Window will appear (below) indicating the progress of the test.

5 If the 980 HDMI Protocol Analyzer's compliance test application reports PASS, then PASS.
If the 980 HDMI Protocol Analyzer's compliance test application reports FAIL, then FAIL.

